investigation and screening of ICs and has been investigated with several model ion channels.
The electrical properties and stability of lipid bilayers suspended across glass micropipettes compared natural and polymerized lipids. Breakdown voltage, capacitance, and conductance of the several pure and mixed polymerizable/non-polymerizable lipid bilayers were determined using a patch clamp apparatus.
Using, polymerizable phospholipids, we have synthesized membranes with markedly enhanced lifetimes from ca. 3 hours to upwards of 3 weeks. These poly(lipid) bilayers have been used to monitor IC activity of alpha-hemolysin for ca. 1week before loss of alpha-hemolysin. However, poly(lipid) bilayers are rigid and do not support the function of ICs that require membrane fluidity, To address this limitation, binary bilayers composed of poly(lipids) and non-polymerizable lipids were investigated. The resulting mixed bilayers demonstrate markedly enhanced long term stability compared to non-polymerized bilayers and facility IC studies. Alamethicin, a model for voltage-gated ion channels, was shown to be non-functional when reconstituted into homogeneous poly(lipid) bilayers, whereas reconstitution in to mixed bilayers revealed alamethicin activity that and enhanced membrane stability.
A functional, truncated form of the K_{ATP} channel complex, 6xHis-EGFP-Kir6.2d26, was chosen as a model ligand-gated IC, expressed and purified from yeast. Long-term goals are to reconstitute the truncated version of K_{ATP} channels into polymerizable and non-polymerizable bilayers using varying strategies into biomimetric sensing platforms screening ligands and drug candidates for activity.

1495-Pos
Solid-Supported Bilayer Lipid Membranes from Lipid Mixtures: Structure and Composition
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Biological membranes are of overarching importance for all aspects of cell structure and function in living organisms. Planar tethered bilayer lipid membranes (tBLMs) are synthetic membrane models stabilized by the proximity of a solid substrate that enhances its long-time stability by orders of magnitude.[1,2] A nanometer-thin hydration layer between the bilayer and the substrate ensures that the biomimetic lipid membrane remains fluid with in-plane lipid dynamics similar to that in vesicles.[3] In this work we establish tBLMs composed of binary and ternary lipid mixtures as more complex, and hence more realistic, membrane models. Such membranes may be used for studies of protein-membrane interactions.[4] Biophysical properties of mixed tBLMs vary significantly with bilayer composition. We report a structural and compositional characterization by neutron reflectometry of tBLMs that comprise various lipid compositions including cholesterol. With specific deuteration of selected bilayer components, such studies enable the determination of volume fractions of individual lipid species in the asymmetric tBLM. A new composition-space model was developed to interpret neutron reflectivity data of such systems. This model enables for the first time to extract more detailed information about the bilayer leaflet proximal to the substrate and lets us explore in more detail the distribution of lipid components across the bilayer. Such a detailed structural and compositional assessment is the prerequisite for more detailed studies of the association of amyloid-beta oligomer particles with membranes in studies on the origin of Alzheimer's disease.[4]
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1496-Pos
Condensing and Fluidizing Effects of Gangliosides on Various Phospholipid Films
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In model membrane mixtures that mimic lipid raft compositions, the more ordered domains are enriched in the ganglioside, G_{M1}, which contains four neutral sugars and a negatively charged sialic acid. To understand the organization and partitioning of G_{M1} in cell membranes, the outer leaflet of the cell membrane was modeled using Langmuir monolayers of DPPC and varying concentrations of G_{M1}. At low biologically relevant concentrations, G_{M1} condenses the DPPC monolayer while at higher concentrations, it fluidizes, with a switch-over point between the two behaviors at a ratio of 3:1 DPPC:G_{M1}. Atomic force microscopy performed on deposited monolayers indicated that G_{M1} is located in nanoscale clusters within the condensed DPPC domains. The total surface area of these nanosize domains is larger than that attributable to G_{M1} molecules alone, suggesting the regions are due to G_{M1} and DPPC packing preferentially in condensed complexes due to variations in molecular geometry.
To further study this effect, geometry of the phospholipid was varied. The zwitterionic lipid, 1,2-dimyristoyl-*sn*-glycero-3-phosphoethanolamine (DMPE), with its smaller headgroup cross-sectional area compared to DPPC, was combined with various ratios of G_{M1}. Additivity plots constructed for the mixtures to show deviations from ideal mixing indicated a 3:2 DMPE:G_{M1} ratio was most condensed compared to the individual components. Molecular geometry of the phospholipid headgroup plays a role in the condensation effect of G_{M1} on neighboring phospholipids. Additional experiments on certain monolayer mixtures of 1,2-dilauroyl-*sn*-glycero-3-phosphoethanolamine (DLPE) and G_{M1}, components that are each fluid in pure monolayers, showed formation of condensed domains. This indicates the condensation effect of G_{M1} is strong enough to induce biologically relevant ordering phase transitions. Results will also be shown from experiments combining phospholipids containing negatively charged phosphatidylglycerol headgroups with G_{M1} to show the effect of electrostatic repulsion on the induced condensation.

1497-Pos
Determining the Water Content of Lipid Membranes by Neutron Diffraction
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Knowledge of the structure of fluid lipid bilayers is essential for understanding complex biological phenomena in cellular membranes. Water, in particular, is an important component of the membrane since membrane proteins anchor and function in cellular membranes through interactions with water and lipid polar headgroups. Here we present an experimental method to determine directly the content of water in a membrane, at thermodynamic equilibrium with its environment, which does not require knowledge of the density of water. Neutron diffraction and specific lipid deuteration is employed to determine the number of waters in a unit cell (lipid alone or lipid/peptide and lipid/cholesterol mixtures) of oriented lipid multilayers hydrated from water vapor phase, under various humidity conditions. Having determined the number of deuterium atoms per lipid by Mass Spectroscopy, the number of water molecules per lipid can be determined with high precision by neutron diffraction, using the content of deuterium in the sample as a calibration measure. The number of water molecules per unit cell will be presented for a few lipid types (phosphocholines or charged-headgroup lipids), and compared with results obtained by other methods. The extent to which the water held in a membrane is altered by the presence of cholesterol or a voltage-sensing trans-membrane peptide will be demonstrated.

1498-Pos
Observation of Intermediates in Lamellar to Cubic Phase Transformations of Lipid Nanoparticles
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Self-assembled lipid systems have recently come to prominence in medical applications as potential carriers for a range of bioactive agents (1); these include medical imaging, therapeutic compounds. One of their primary advantages is versatility as they can be adapted to different agents and target sites. During the preparation of cubic phase lipid nanoparticulate dispersions, we observed the presence of new intermediates during the transition from the fluid lamellar lyotropic phase to the cubic phase. This phase transition is regarded as a model for membrane-fusion processes(2). Many organelles demonstrate highly ordered cubic membrane structures. Determining the mechanistic origins of such lipid organelle complexity has been elusive.
We increased the lifetime of very short-lived non-equilibrium intermediate structures by the use of steric stabilizer in the dispersions. These structures were characterized using synchrotron small-angle X-ray scattering and